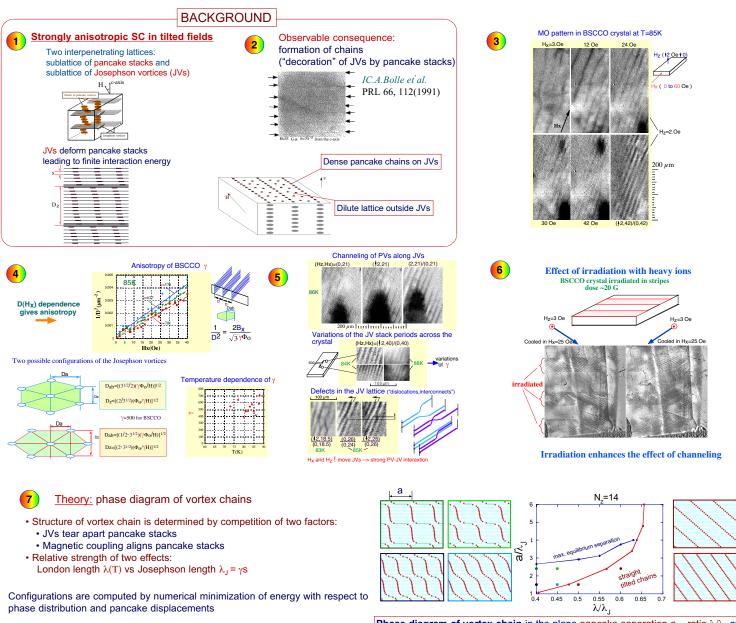
## Interacting Pancake/Josephson Vortices:

## A New Opportunity for the Superconducting Cryo-Electronics

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- We investigated interactions between Josephson and pancake vortices in Bi<sub>2</sub>Sr<sub>2</sub>CaCu<sub>2</sub>O<sub>8+8</sub> single crystals by magneto-optical technique. We found peculiarities in the pancake vortex patterns decorating Josephson vortices, which reveal strong coupling between the two vortex subsystems.
- The accuracy of the anisotropy estimates from the field dependencies of the Josephson vortex periods is limited by possible transitions between equilibrium and nonequilibrium JV configurations that show themselves in stepwise shape of D(H) observed in the experiment.
- Unexpectedly, effects due to the Josephson-pancake vortex interactions are enhanced by the heavy ion irradiation as observed in periodically irradiated samples.
- We theoretically investigated the structure of an isolated vortex chain in the parameter space. With increasing ratio London penetration depth/ Josephson length the chain first transforms from the crossing configuration of Josephson vortices and pancake stacks into the modulated tilled chains and then transforms into the chain of tilted straight vortices.



With increasing ratio  $\lambda/\lambda_J$  (e.g., with increasing temperature): crossing configuration → modulated tilted chains → straight tilted chains

Deformed pancake stacks attract each other (Buzdin&Baladie, PR B 2002) → maximum equilibrium separation

Phase diagram of vortex chain in the plane pancake separation a – ratio  $\lambda/\lambda_J$  at

fixed separation between JVs, N<sub>2</sub>=14 layers. Chain configurations are shown at colored points (red circles show pancake positions and green lines show JVs). Red line marks phase transition modulated tilted chains → straight tilted chain. Blue solid line shows maximum equilibrium separation due to attractive coupling between pancakes stacks

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